MCCRP SITE DESIGN REPORTS

APPENDIX C.1. WENATCHEE AND COLUMBIA REARING FACILITIES

Yakama Nation Fisheries Resource Management

CONTENTS

List of Figures

I. *INTRODUCTION*

This report presents site information for proposed Mid-Columbia coho program rearing facilities located in the Wenatchee subbasin and on the lower Columbia River. The Wenatchee facilities will produce fish (adult spawning, early incubation, and acclimation) for release in the Wenatchee subbasin. The lower Columbia hatcheries will rear fish (hatching through pre-smolt) for release in both the Wenatchee and Methow. A separate report describes proposed Methow subbasin rearing facilities. Following is a list of master plan facility appendices, with this appendix highlighted.

A. FISH CULTURE GUIDELINES
B. ALTERNATIVE AND PROPOSED FACILITY PLANS - EVALUATIONS
    B.1 REARING FACILITIES ALTERNATIVES
    B.2 ACCLIMATION FACILITIES ALTERNATIVES
C. PROPOSED FACILITY PLAN DETAIL – SITE DESCRIPTIONS AND CAPITAL COSTS
    C.1 WENATCHEE REARING FACILITIES
    C.2 METHOW REARING FACILITIES
    C.3 WENATCHEE ACCLIMATION FACILITIES
    C.4 METHOW ACCLIMATION FACILITIES
D. PROJECT SCHEDULE AND COSTS

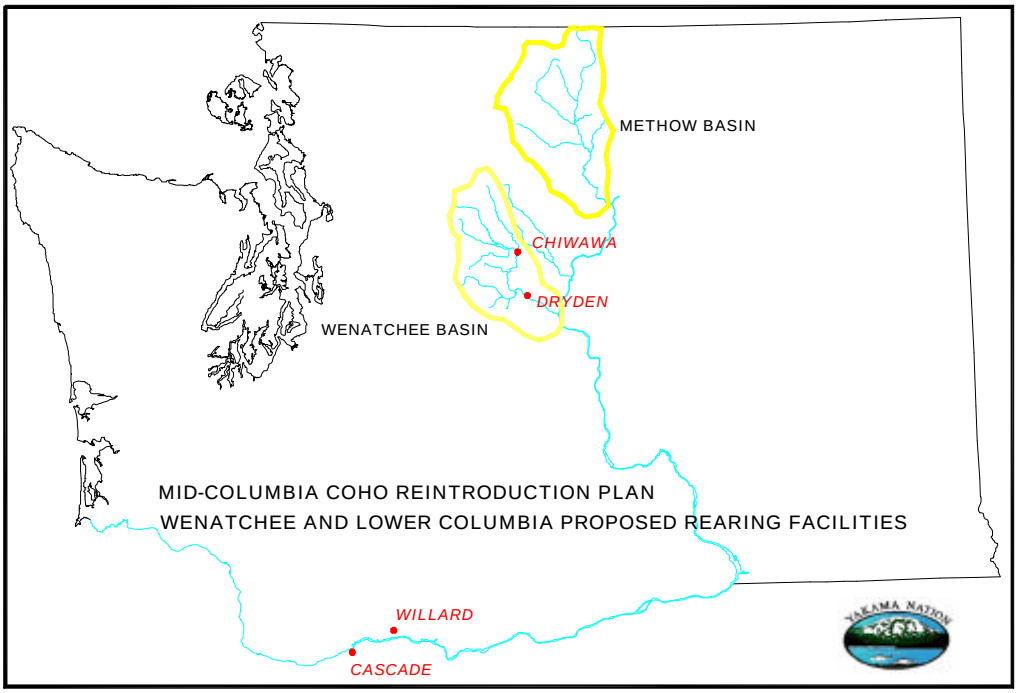


Figure 1. Location Map

II. *PROPOSED REARING FACILITIES*

For the duration of the program, project proponents propose to continue to rear coho at the existing Willard National Fish Hatchery and Cascade Fish Hatchery on the lower Columbia River. However, due to the distance of these hatcheries from the Wenatchee basin, adult holding and early incubation will need to be done at other locations. Currently, Entiat NFH is being used for these functions; however, Entiat NFH is being considered for a programmatic change which would preclude its use by the MCCRP during the fall.

A. ADULT HOLDING AND INCUBATION FACILITY

A new, small adult holding and early incubation facility is proposed on the Wenatchee River. This facility would provide a centrally located site for handling the valuable local broodstock and incubation of eggs to the eyed stage.

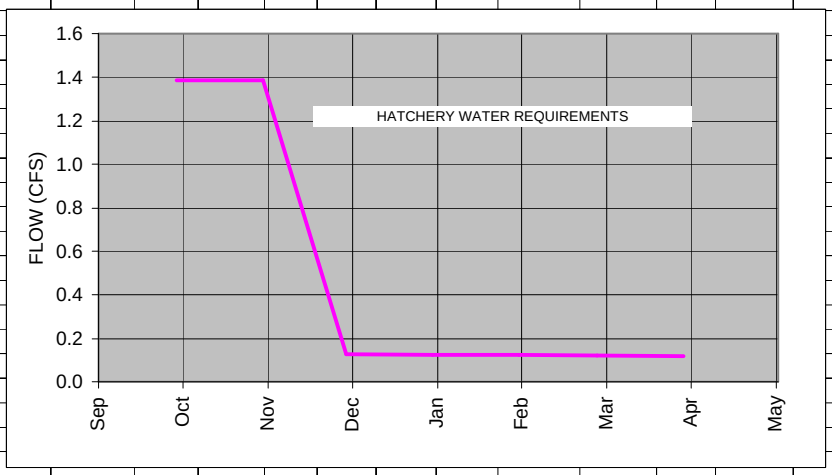
1. DRYDEN

The preferred location for this facility is near Dryden Dam at the mouth of Peshastin Creek. Ground water supplies would be developed to supply adult holding raceways and incubators. The site is in a location that would allow the development of rearing capacity with a surface water intake in the future, if required.

a. Facility Requirements

- Site functions: The Dryden facility would perform limited functions. All captured local Wenatchee brood would be trucked to the proposed facility for holding and spawning. Eggs would be reared to the eyed stage, after which they would be moved to the two lower river facilities, Cascade FH and Willard NFH, for hatching and early rearing.
- Production numbers: 1,300 adults and 1,300,000 eyed eggs.
- Development timing: Current plans call for hatchery construction to start during the second quarter of 2008, testing to occur in 2009, and operation to begin in 2010.

Period	Rearing	Water	Water	Number	Number at	Fish	Fish	Fish	Flow	Vol.	Flow	Volume	Weight at	Min.	**Min.**	Min.	**# of**
	Unit	Source	Temp.	Trucked	Hatchery	Size	Size	Size	Index	Index	Density	Density	Hatchery	Flow	**Flow**	Volume	**Units**
			(^{0}F)		at Month End	*lbs*	*#/lb*	*inch*			*lbs/gpm*	*lbs/cft*	*lbs*	*gpm*	**cfs**	*cft*	
10/1	Adult	Ground	48		1,248	7								624	**1.4**	4,992	**2**
11/1	Adult	Ground	48		1,248	7								624	**1.4**	4,992	**2**
12/1	Inc	Ground	45		1,300,000									58	**0.1**		**10**
1/1	Inc	Ground	45		1,275,625									57	**0.1**		**10**
2/1	Inc	Ground	45		1,251,707									56	**0.1**		**10**
3/1	Inc	Ground	45		1,228,238	0.001	1000	1.49	1.09	0.17	1.6	0.25	1,228	55	**0.1**		**10**
4/1	Inc	Ground	45		1,205,208	0.001	1000	1.49	1.09	0.17	1.6	0.25	1,205	54	**0.1**		**9**



PROGRAM INPUTS		
ADULTS		
Adult size:	7	lb
Eggs per female:	2500	
Adult loss during holding:	20%	
Pond space per fish	4	cft
Water flow per fish	0.5	gpm
Adult water pond volume:	3000	cft
INCUBATION		
Inc. capacity (#/per tray)	9,000	
Max. eggs/stack	135,000	
Water flow per full stack	6	gpm
REARING		
Number released:	1,000,000	
Inc. to release mort.:	30%	
Raceway Vol. Index:	1.0	
Pond Volume Index:	0.3	
Flow multiplier	2.0	
Volume multiplier	6	
Trough water volume:	189	cft
Raceway water vol.:	3000	cft
Pond water volume:	15750	cft

Figure 2. Dryden Water and Space Programming

b. Site Information

- Location, elevation: Near the mouth of Peshastin Creek; in T24N, R18E, SW ¼ of S22 in Chelan County; adjacent to Dryden Dam; elevation 980 feet.
- Tributary of: The Wenatchee at river mile 18.
- Ownership: The 8.5-acre Washington State Department of Transportation (WSDOT) property (see Figure 4), is lot number 241822745006, zoned Commercial Agricultural Lands (AC). The 15.5-acre Willow Springs Orchards property (see Figure 4) is lot number 241822745055, zoned Rural Residential /Resource (RR2.5).
- Geotechnical conditions: Soils are likely AASHTO classifications A-1 to A-2.
- Critical areas designation: Unknown.
- Flood designation: Zone X500 (between 100 and 500 year floods). The proposed site sits on a bench that is 20 to 40 feet above the Peshastin Creek delta. Construction in this area will allow the hatchery to sit above the 100-year flood elevation without placing fill in the floodplain.
- Current land use: The proposed hatchery site is an orchard; the proposed infiltration gallery area is used by WSDOT for storage of highway sand.
- Access: Plowed, paved roads.

? Utilities: 3-phase power is available at the nearby Dryden right bank ladder facility; telephone lines at the road could be brought into the facility.

? Trucking distances: Approximately 40 miles from the upstream acclimation sites on the White, Chiwawa, and Little Wenatchee rivers and Nason Creek.

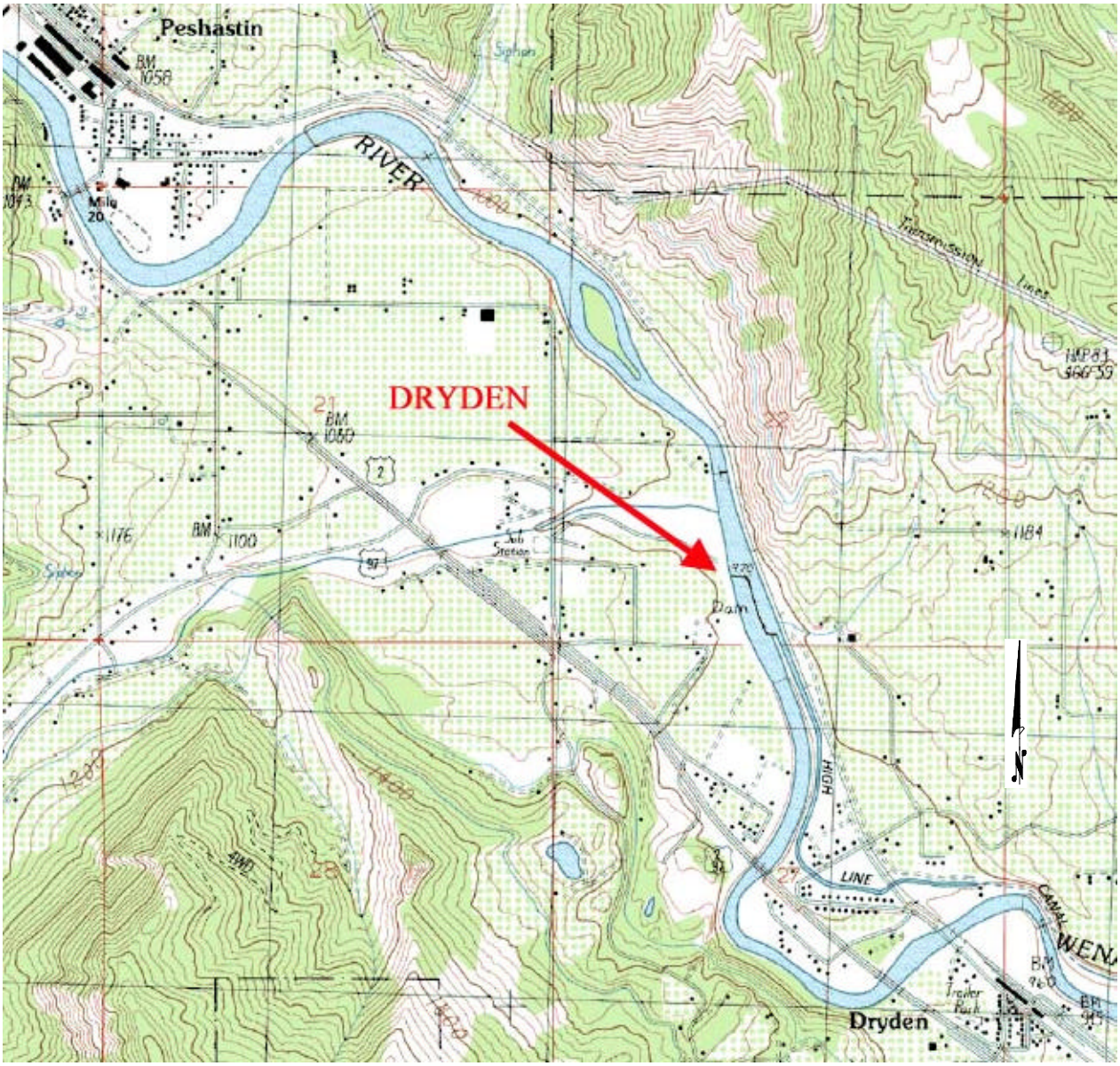


Figure 3. Dryden USGS Map

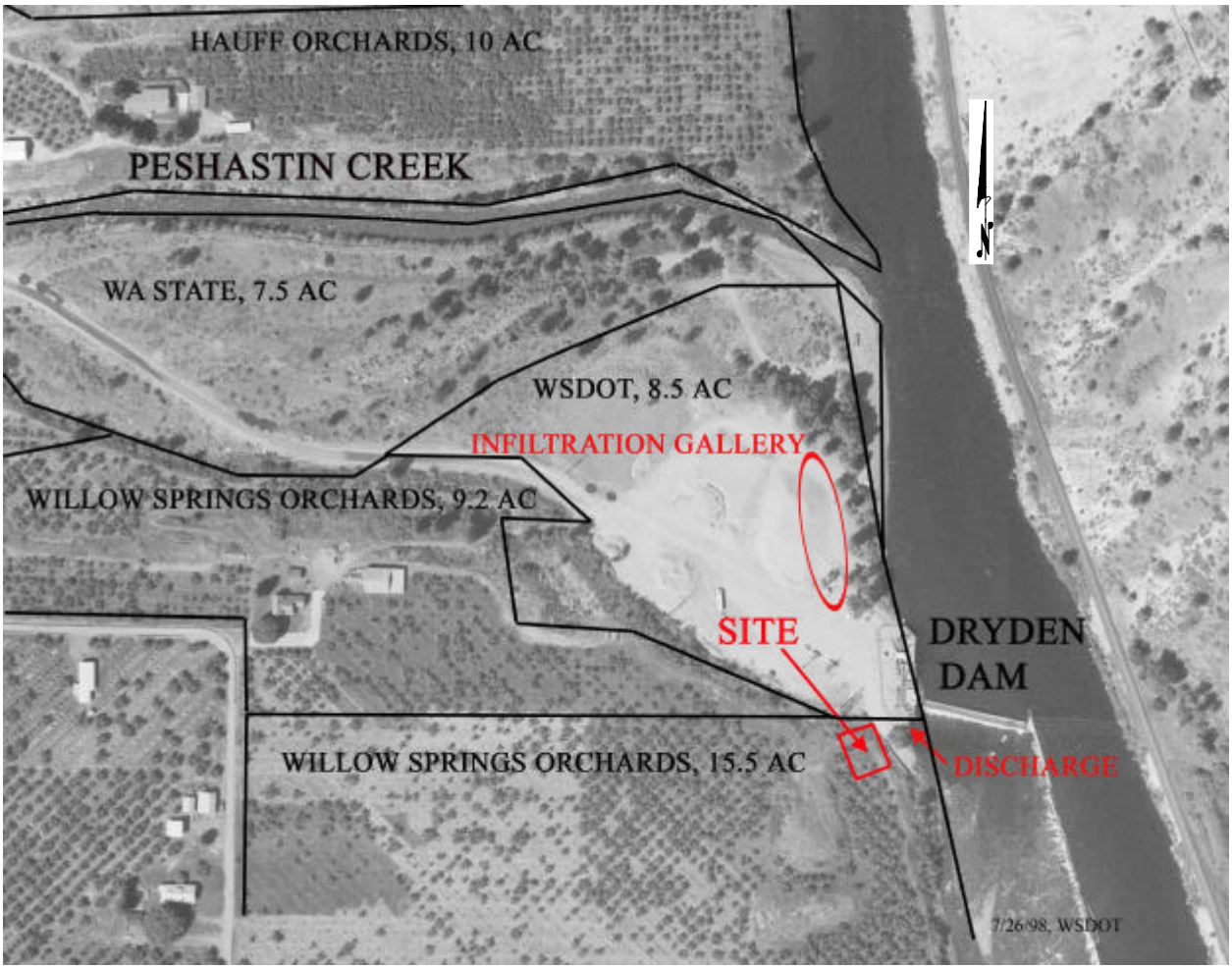


Figure 4. Dryden Aerial Photo

Figure 5. Dryden Oblique Aerial

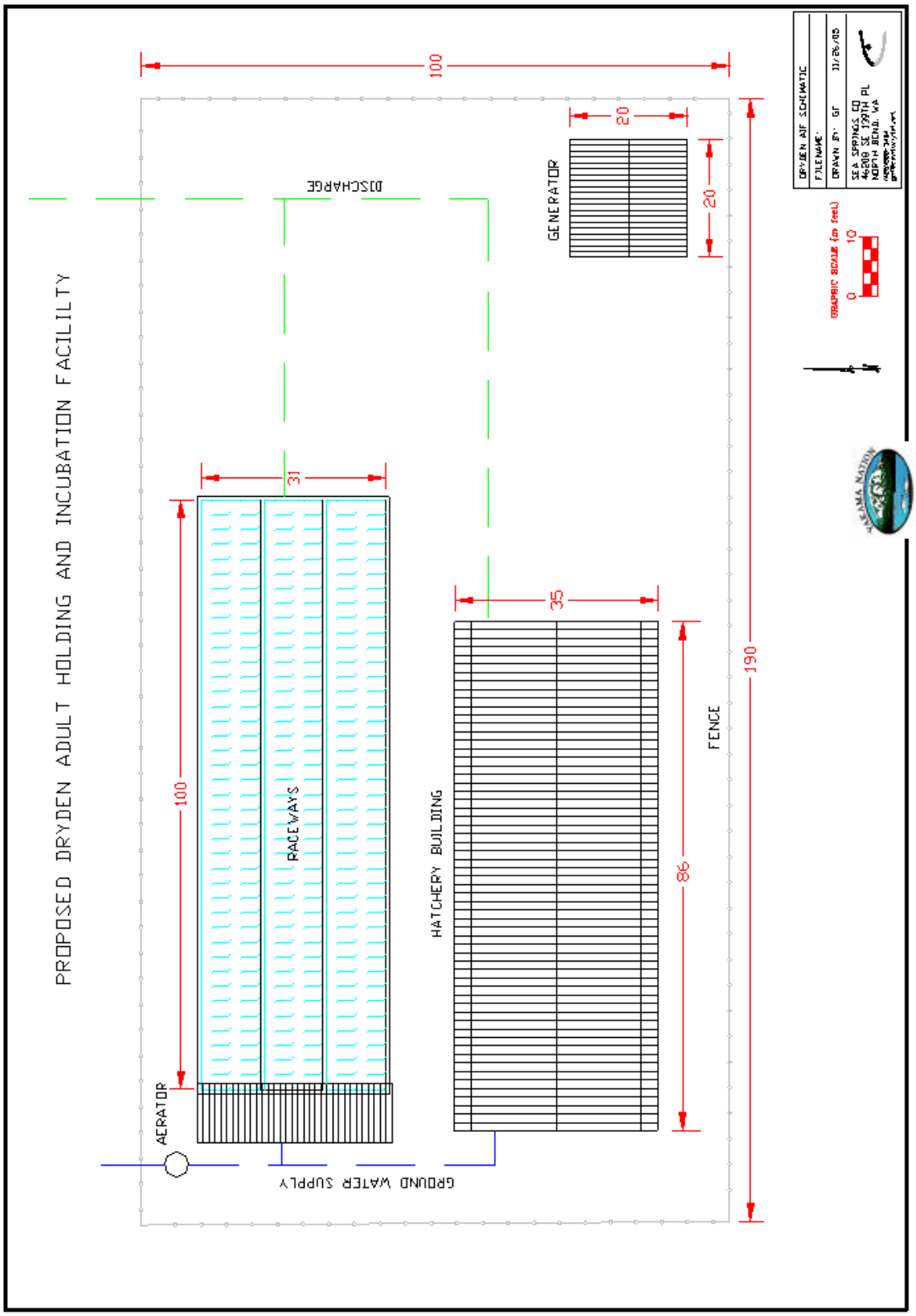
Figure 6. Dryden Site Photo

c. Water Supply

- Groundwater availability: The geology of the site suggests productive groundwater conditions. Historic gravel deposition at the Peshastin alluvial fan may have left thick layers of clean gravel.
- Groundwater withdrawal. An infiltration gallery is proposed, although deeper well water may also be available.
- Flood levels: The area where an infiltration gallery is proposed is within the 100-year flood boundaries; the facility site is above it.
- Groundwater temperature: Unknown, likely close to the average annual air temperature in the area, 48° F at Dryden (data from the Western Regional Climate Center).

d. Proposed Design

- Water supply: Water from the infiltration gallery would be piped to the facility site, then run through a packed column to put it into gas equilibrium with air.
- Adult holding: 3 concrete raceways (the 2 required plus a back-up), will be available for holding adults. Multiple divisions in the raceways will allow fish at different levels of development to be held separately.
- Incubation: 10 vertical stack incubators will be capable of incubating 1,300,000 coho eggs.
- Water discharge: Return of water to the Wenatchee is proposed at the Dryden right bank ladder entrance to improve attraction for returning fish.
- Predator control, cover: The site will be fenced and an overhead net system will be installed.
- Waste treatment: Adults will not be fed so raceway discharge will not be treated. Incubation effluent will require formalin removal. This will be done in the facility building.
- Facility size: The proposed layout requires 19,000 square feet (0.4 acres) of land.
- Site plan: See Figure 7.


PROPOSED DRYDEN ADULT HOLDING AND INCUBATION FACILITY
100
20
20
GENERATOR
DISCHARGE
31
100
RACEWAYS
35
HATCHERY BUILDING
86
FENCE
190
AERATOR
GROUND WATER SUPPLY
GRAPHIC SCALE (in feet)
0
10
DRYDEN AIF SCHEMATIC
FILENAME:
DRAWN BY: GF
11/26/05
SEA SPRINGS LLC
YAKAMA NATION

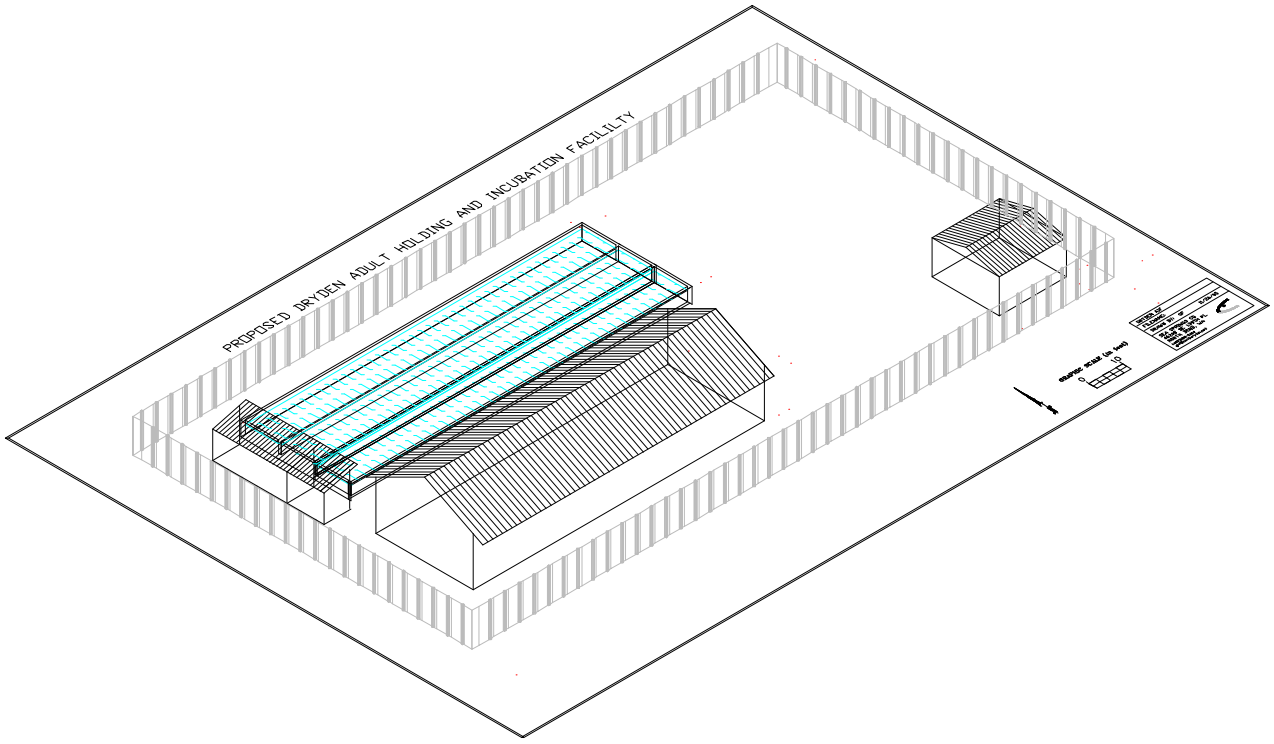


Figure 7. Dryden Facility Plan

e. Environmental Issues

- Listed species: Bull trout, steelhead, and spring chinook migrate through the Wenatchee River but would not be adversely affected by the facility. The water intakes from the Wenatchee and Peshastin Creek would meet NMFS screening and design criteria for listed fish (NMFS 2004).
- Floodplains: The facility structures will be outside the 100-year floodplain and the infiltration gallery will be below grade, resulting in no net impact to flood storage capacity.
- Water rights: Due to the presence of a large number of wells in the area and the potential large hatchery withdrawals, well operation may affect surrounding property owners. An infiltration gallery would have less impact on deeper aquifers because it draws water from a surface aquifer that is recharged by surface water. Hydrologic impacts on flow in Peshastin Creek are possible and will need to be evaluated.
- Other fish operations: Other fish operations upstream of the proposed site will not likely impact operation of this coho facility. The only fish facility in the vicinity is Chelan PUD's Dryden Summer Chinook Acclimation Pond, which is located across the Wenatchee River (left bank) and downstream a half mile. However, the water intake for this acclimation pond is upriver of the proposed Dryden site, and the summer chinook acclimation facility is not used during the months the proposed facility would be used, so discharge from the proposed facility would not impact the PUD acclimation pond.

f. Development Risks

- Groundwater availability: Lack of groundwater would prevent development of the site; however, geologic conditions (see c. above) are favorable for groundwater development.
- Water quality: Use of agricultural chemicals in nearby farmland could adversely affect water quality at the proposed facility.

- Other permits: A general permit summary is included in Attachment 1. Because the required environmental processes would not be completed until later phases of the decision-making process, risks exist of not being able to obtain some of these required permits. Risks include local property owner opposition. Farmers may be threatened by fish restoration projects in general if they believe that their irrigation water rights will be reduced because of minimum instream flow requirements for fish.
- Land availability: Negotiations with the private land owners for use of the hatchery property, with Chelan PUD for construction near the Dryden ladder, and with WSDOT for use of land for infiltration gallery construction would not be conducted until later phases of the decision-making process; therefore, availability of these properties is not yet known.

2. ALTERNATIVE

A site on the Chiwawa River immediately adjacent to the existing Chelan Public Utility District (PUD) Chiwawa Acclimation Pond is identified as an alternative to Dryden. Dryden has been selected as the preferred option because development risks, particularly land ownership, are somewhat lower than for Chiwawa. Development risks, including ownership issues, are detailed below.

Site Information

- Location, elevation: Near the mouth of the Chiwawa; in T27N, R17E, SE ¼ of S36 in Chelan County; adjacent to the Chiwawa acclimation facility; elevation 1,870 feet.
- Tributary of: The Wenatchee at river mile 49.
- Ownership: Parcel 271736100000 is a 538 acre site owned by the USFS, ownership boundaries are shown on Figure 8. The Chiwawa intake is on a parcel (26170121025) owned by Chelan County PUD. (See also: Figure 9).
- Geotechnical conditions: Site development is not limited by physical terrain characteristics. Soils are likely AASHTO classifications A-1 to A-2.
- Zoning: Rural Residential /Resource (RR20).
- Critical areas designation: Unknown.
- Flood designation: Zone X500 (between 100 and 500 year floods).
- Current land use: Forested with an acclimation site adjacent to the proposed hatchery site. Recreation and permanent homes are located within a thousand feet.
- Access: Plowed, paved roads.
- Utilities: 3-phase power and telephone are available at the acclimation site.
- Expansion capability: Land would be available for expansion.
- Trucking distances: Within 20 miles of the upstream acclimation sites on the White, Chiwawa, and Little Wenatchee rivers and Nason Creek.
- Current rearing capacity: None.

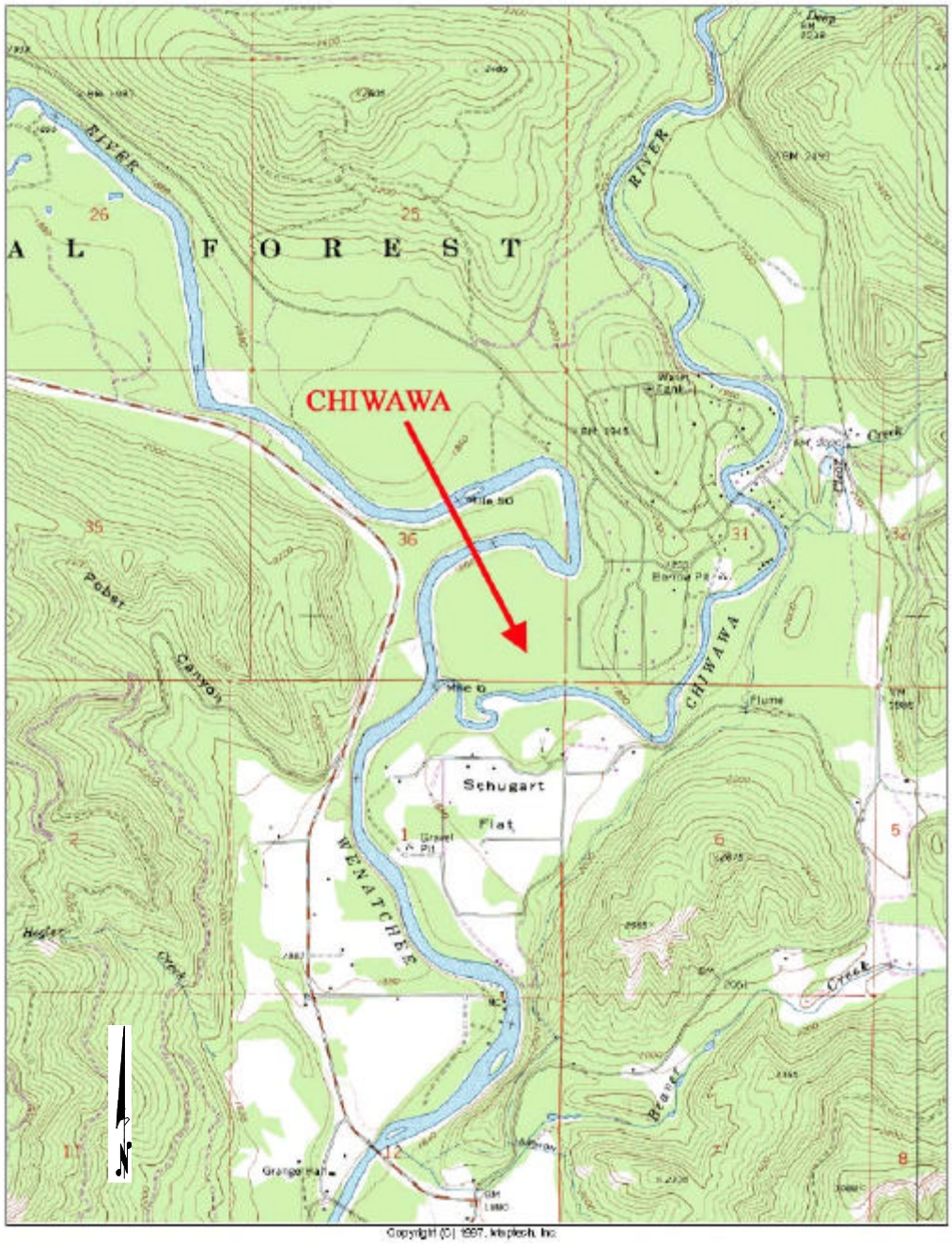


Figure 8. Chiwawa USGS Map

Water Supply

? Groundwater availability: GeoEngineers (2002) suggested that the geology of the site could produce significant amounts of groundwater. Historic gravel deposition at the Chiwawa alluvial fan may have left thick layers of clean gravels. However, 6 test wells to depths up to 90 feet were drilled in the vicinity of the acclimation site in 1988 and none produced more than 50 gallons per minute (gpm). A shallow infiltration gallery may be more likely to produce larger quantities of water due to geologic conditions.

- Groundwater temperature: Unknown, likely close to the average annual air temperature in the area, which is 45° F at Plain (data from the Western Regional Climate Center).

Environmental Issues

- Listed species: The area is potential wolf, lynx, grizzly bear, bald eagle, spotted owl, Nelsons checker-mallow, and Ute ladies'-tresses habitat. The site is within spotted owl reserve habitat designated by the USFS; the construction or presence of a coho facility could disturb owls. Bull trout, steelhead, and spring chinook exist in the Chiwawa and Wenatchee rivers. During the feasibility phase of the mid-Columbia coho program, negative interactions between hatchery coho and other fish species were found to be unlikely (see Chapter 3 of the master plan). Project proponents propose to monitor negative effects of naturally produced coho on ESA-listed and other sensitive species (see Chapter 7 of the master plan). Analysis of facility development effects on other ESA-listed and USFS sensitive species would be done during the NEPA process that must be completed before final location decisions are made.
- Site development: Infiltration gallery and facility construction require that vegetation be disturbed. Listed species might be found at these sites, which must be surveyed and evaluated during the NEPA process, as discussed above.
- Water rights: Impacts of withdrawals from the shallow aquifer are likely to be minimal. Hydrologic impacts to flow in the Chiwawa are possible and will need to be evaluated.
- Wetlands and floodplains: A wetlands survey has not been done on the site. Because the potential gallery is close to the river's edge, wetlands could be present. A survey is needed to determine if there are wetlands. The site is out of the 100-year floodplain.
- Other fish operations: There are no fish production facilities upstream of the proposed site and there are no downstream facilities within 15 miles that would be impacted by the hatchery discharge. Though water intakes and discharge could potentially be shared with Chelan PUD's spring chinook facility, the coho facility would be physically isolated to prevent pathogen transfer

Development Risks

- Groundwater availability: Lack of groundwater would require that surface water be used for adult holding and incubation. This is an acceptable alternative.
- Other permits: Local property owners may oppose expansion of the fish rearing operations at Chiwawa for reasons similar to those described for the Dryden facility. The USFS may oppose construction of an infiltration gallery or the facility itself in spotted owl reserve habitat. A general permit summary is included in Attachment 1. Because the required environmental processes would not be completed until later phases of the decision-making process, risks exist of not being able to obtain the required permits.
- Land availability: Negotiations with the USFS for use of the hatchery property and with Chelan PUD for use of the infiltration gallery property would not be conducted until later phases of the decision-making process, so availability of these properties is not yet known.

B. LOWER COLUMBIA RIVER

1. CASCADE HATCHERY

The Mid-Columbia coho program master plan calls for the continued production of 700,000 pre-smolts from Cascade Hatchery for the life of the proposal. The Methow would receive 550,000 of these and the Wenatchee 150,000.

The Cascade Fish Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program. It is operated by the Oregon Department of Fish and Wildlife (ODFW). The hatchery is supplied with surface water from Eagle Creek and has full rearing capability, with the following facilities (information from IHOT 1996):

- Adult holding: 1 concrete adult holding pond - 22,500 cubic feet
- Incubation: Vertical stack incubators
- Raceways: 30 concrete raceways – 16 feet by 78 feet by 2.5 feet deep; 3,120 cubic feet each (see Figure 11). Figure 12 shows raceways and frames for predator nets and overhead covers

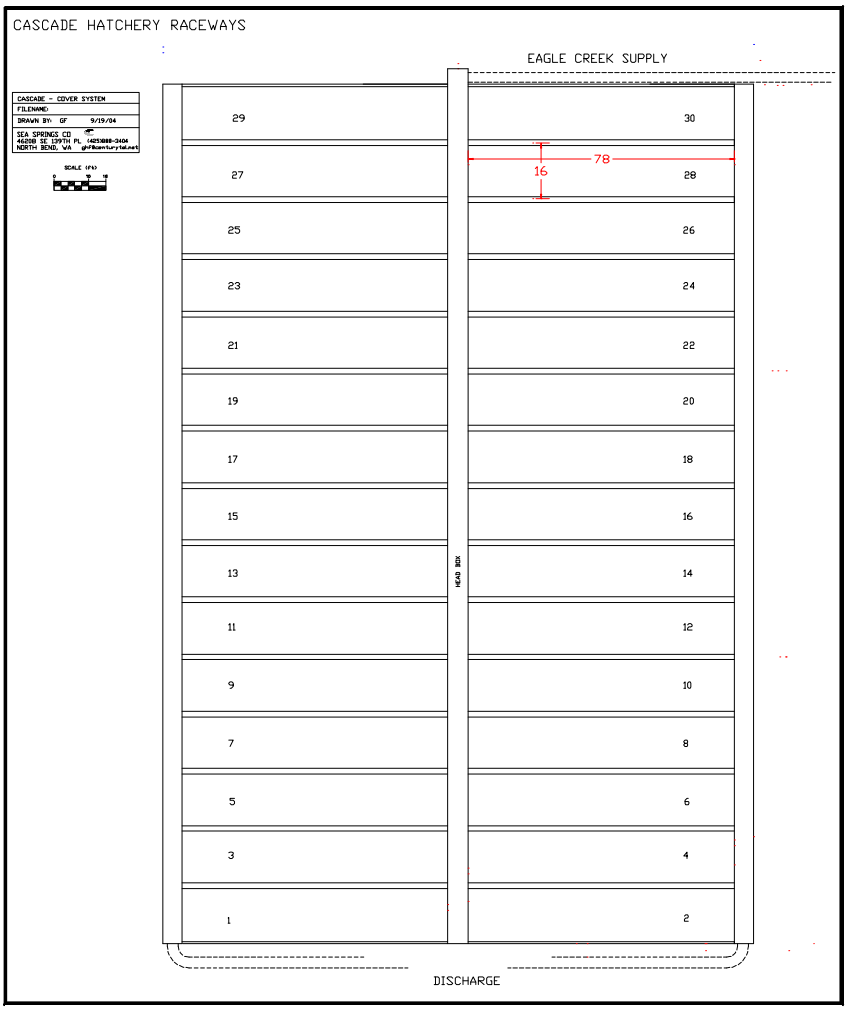


Figure 9. Cascade Hatchery Raceways

Figure 10. Cascade Raceways and Net Frame Photo

(raceways 2,4,6 without overhead cover or predator nets in place)

The 2005 production goals are 700,000 coho for the mid-Columbia coho program, 1,000,000 coho for the Confederated Tribes of the Umatilla Nation, and 600,000 coho for the Clatsop Economic Development Commission. Water is supplied by gravity from Eagle Creek. The total water right is 20,200 gpm (45 cfs) with an actual average water usage of about 7,117 gpm (16 cfs). Typical Eagle Creek water temperatures fluctuate between 2° C in December/January to 17° C in July/August. High summer temperatures create some disease problems, but the large natural fluctuations may produce smolts that survive to adulthood in high numbers (Appendix A).

Fish will need to be trucked up to 250 miles to the upstream acclimation/release sites on the White, Chiwawa, and Little Wenatchee rivers and Nason Creek.

In 2005, the Mid-Columbia coho program reared 700,000 pre-smolts in 8 raceways, or 87,500 fish per rearing unit. Fish sizes for the March transport dates average 20/lb (4,375 lbs/raceway), resulting in volume densities in the raceways of 1.4 lbs per cft, typical for raceway culture but considerably higher than the MCCRP target value for new pond-based hatcheries (0.3 lbs per cft) due to space limitations.

2. WILLARD NATIONAL FISH HATCHERY

The mid-Columbia coho master plan calls for the production of 350,000 pre-smolts from Willard NFH for the Wenatchee program. Production from this facility would continue for the life of the program.

Willard NFH was authorized by the Mitchell Act in 1946 and constructed in 1952. The facility was originally planned as a fall chinook hatchery but changed to spring chinook and coho because of cold water temperatures, and then switched completely to coho in the mid-1960s. It operates on surface water and has full rearing capability, with the following facilities (information from IHOT 1997):

? Early rearing: 52 concrete starter tanks - 91 cubic feet each

? Raceways: 50 concrete raceways – 8 feet by 73 feet by 2.4 feet; 1,408 cubic feet each (see Figure 13). Figure 14 shows raceways with overhead covers.

? 24 full stacks of vertical tray incubators (384 trays)

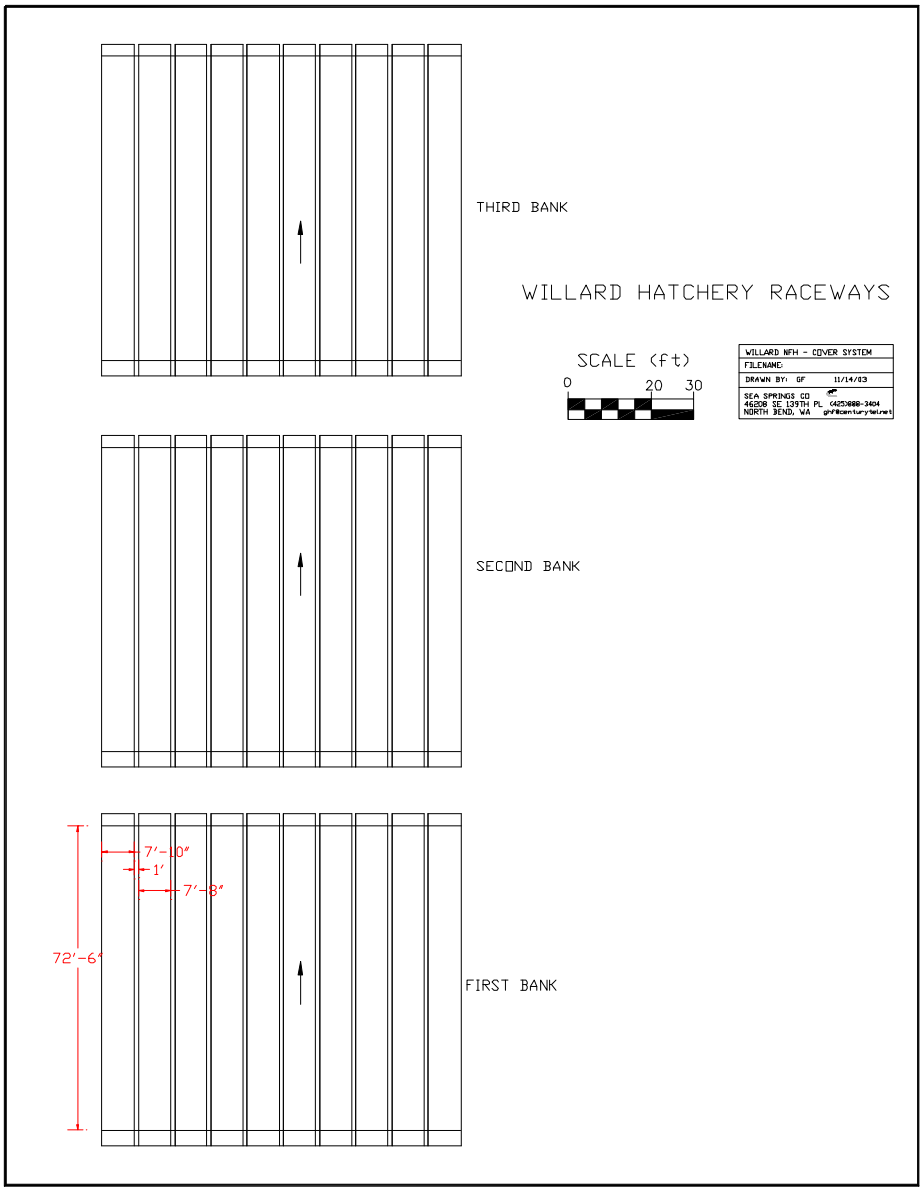


Figure 11. Willard Hatchery Raceways

Figure 12. Willard Raceways Photo

(bank 1 with overhead covers)

The 1997 hatchery production goal was 2,500,000 coho smolts, or 166,600 lbs. Current production is much lower than this and is focused on supporting tribal programs. In 2005 planned production from the hatchery is rearing 600,000 coho for the Mid-Columbia program.

The hatchery is exempt from an NPDES discharge permit because the effluent disappears into porous lava before reaching the Little White Salmon River. Cold water disease has been a problem in the past but is being controlled with improved fish culture techniques. Fish will need to be trucked up to 250 miles to the upstream release sites on the on the White, Chiwawa, and Little Wenatchee rivers and Nason Creek.

The concrete raceways are narrow and shallow, which may have a negative impact on smolt quality (Appendix A). The overhead covers are installed close to the water surface, providing effective shade. The general condition of the hatchery is good. A recent intake rebuild has improved water supply reliability.

Figure 13. Willard Intake

Water is supplied by gravity from the Little White Salmon River, along with some well and spring water for incubation and early rearing (about 1,500 gpm). Water use at the hatchery ranges from 11,221 (25 cfs) to 24,442 gpm (54 cfs). Typical Willard surface water temperatures vary little throughout the year; normally temperatures are between 6 and 8° C. The well water is 4.4° C in December.

The Little White Salmon River originates in the Gifford Pinchot National Forest west of Monte Cristo Peak. It drains 135 square miles of Skamania and Klickitat counties over a distance of approximately 19 miles. The topography in the watershed ranges from gentle slopes formed by lava flows and volcanic cones to steep rugged landforms. The relatively stable flow and temperature of the Little White Salmon indicates strong groundwater influences. Anadromous fish passage upstream of the Willard hatchery is blocked by a series of waterfalls. Therefore, transfer of fish pathogens into the hatchery water supply that could impact coho production is not possible.

Willard typically rears 35,000 coho smolts per raceway. Fish sizes for the March transport dates average 20/lb (1,700 lbs/raceway), resulting in volume densities in the raceways of 1.2 lbs per cft.

3. ALTERNATIVES

Other existing Mitchell Act hatcheries in the region have excess rearing capacity. Several facilities have been closed in recent years including Klaskanine, Gnat, Beaver, Stayton and Abernathy. Currently operating Mitchell Act hatcheries (Big, Elochoman, Coweeman, Lower Kalama, Kalama Falls, Lewis, Carson, Oxbow, Spring Creek, Bonneville, Skamania, Sandy, Clackamas, Eagle) are facing reduced production as funding for lower Columbia River releases is decreased. These facilities could potentially produce coho for the MCCRP if Willard or Cascade are not available.

III. *CAPITAL COSTS*

A. COST ESTIMATE

No capital costs are expected for the existing rearing facilities. The expected costs for constructing the Dryden adult holding and incubation facility are summarized in the table below.

	Description	Quan.	Units	Unit Cost	Cost	Totals
CONSTRUCTION						
SITEWORK		1.0	acre			$ 95,307
Mobilization/demobilization		1	ls	$ 30,000	$ 30,000	
Roads	Gravel access and site roads	800	lft	$ 18.00	$ 14,400	
Erosion Control	Silt fences, vegetation mats	1	ls	$3,500.00	$ 3,500	
Earthworks	Drop the site an average of 10', move cut 300'	7,407	cy	$ 6.40	$ 47,407	
GROUND WATER SUPPLY		4.0	cfs			$ 386,400
Infiltration gallery	100', yield of 18 gpm per ft	1	ea	$ 325,000	$ 325,000	
Pump chamber	Concrete vault	1	ea	$ 10,000	$ 10,000	
Aeration towers	Packed columns	2	ea	$ 5,000	$ 10,000	
Piping	18" PVC SDR35, sand bedding, fittings	600	ft	$ 69.00	$ 41,400	
ELECTRICAL/GENERATORS						$ 112,950
Power delivery	Poles, lines to deliver power to site	500	ft	$ 4.90	$ 2,450	
Generator building	With air cooling system	400	sft	$ 120	$ 48,000	
Conduit	To infiltration gallery	1,500	lft	$ 15.00	$ 22,500	
Site electrical	Service drop, wire pumps, generator	1	ls	$ 30,000	$ 30,000	
Alarm system	Alarms, conduit, autodialer	1	ls	$ 10,000	$ 10,000	
RACEWAYS	3 @ 10'x100'x4'					$ 155,237
Raceways	8" walls and floor	136	cy	$ 800	$ 109,037	
Spawning shed	30'x10'	300	sft	$ 70	$ 21,000	
Predator net system	Predator nets and overhead covers	3,600	sft	$ 7.00	$ 25,200	
MISC						$ 273,400
Discharge piping	18" PVC SDR35, sand bedding, fittings	200	ft	$ 69	$ 13,800	
Water outlet	Discharge stabilization, cover 400 sft	60	tons	$ 90	$ 5,400	
Hatchery building	Incubation, shop, office	2,400	sft	$ 100	$ 240,000	
Fencing	8' chain link	600	lft	$ 22	$ 13,200	
Site revegetation		1	acres	$ 1,000	$ 1,000	
CONSTRUCTION SUBTOTAL						**$ 1,023,294**
Unlisted item allowance	Contingencies	30%				$ 306,988
Contractor overhead	Construction management, profit	20%				$ 204,659
Sales tax		7.0%				$ 71,631
CONSTRUCTION SUBTOTAL						**$ 1,606,572**
CAPITAL EQUIPMENT						
Chillers, incubators	2 chillers @ 10 ton, 18 incubator stacks	1	ls	$ 78,000	$ 78,000	
Ground water pump, controls	2 cfs ea, 30' head, 10 hp ea, sequential start, overloa	3	ea	$ 7,000	$ 21,000	
Generators	36 Kw ea, 48 hour fuel tank	2	ea	$ 38,000	$ 76,000	
Haul Tanks	1 at 1,000 gal	4	ea	$ 3,000	$ 12,000	
Sales tax		7.0%			$ 13,090	
CAPITAL EQUIPMENT SUBTOTAL						**$ 200,090**
LAND PURCHASE						
Real estate appraisal		1	ea	$ 5,000	$ 5,000	
Land audit	Environmental appraisal, soils	1	ea	$ 3,000	$ 3,000	
Land purchase	Purchase from private owner	5	acre	$ 50,000	$ 250,000	
Real estate tax		13%			$ 32,500	
LAND PURCHASE SUBTOTAL						**$ 290,500**
TOTAL						**$ 2,097,200**

KEY: LS = Lump Sum, EA = Each, LFT = Linear Feet, SFT = square feet, CFT = cubic feet, CY = Cubic Yards, MO = month, HRS = hours

Figure 14. Dryden Capital Cost

B. BASIS FOR THE COST ESTIMATE

In as many cases as possible, cost estimates in this and the other C appendices were based on vendor invoices and subcontractor budgets for similar projects completed by the MCCRP and Yakama Nation coho programs. These projects include:

- Prosser Hatchery
- Marion Drain Hatchery
- Rohlfing well and acclimation pond
- Entiat chillers
- Prosser inlet settling pond fencing
- Two Rivers well
- Beaver Creek outlet structure
- Biddle outlet structure
- Beaver Creek discharge stabilization
- Hancock Springs wood placement and tree plantings
- Cascade, Leavenworth, and Willard hatchery predator net systems

Costs for other recent, regional projects were used as well; they include the Winthrop infiltration gallery; Wahkiacus 3-phase power; Wahkiacus hatchery building (design and cost estimates by Cascade Design Professionals); and the McCreedy acclimation site on the Klickitat.

Where actual cost data were not available, estimates were developed by Sea Springs Co. using standard construction cost estimating methods. The 2006 Heavy Construction Costs Estimating Software was used to confirm these costs from other sources and to produce estimates where needed.

Land costs were based on a review of recent real estate listings of property for sale in the area. Averages of values for comparable property were used to estimate the Dryden land cost.

IV. *REFERENCES*

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NMFS. 2004. Anadramous Salmonid Passage Facility Guidelines and Criteria. National Marine Fisheries Service, Northwest Region. January 31, 2004.

Piper, R., I. McElwain, L. Orme, J. McCraren, L. Fowler, J. Leonard. 1982. Fish Hatchery Management. U.S. Dept. of the Interior, Fish and Wildlife Service.

V. *ATTACHMENT 1. PERMIT SUMMARY*

JARPA - Joint Aquatic Resource Permits Application		
HYDRAULIC PROJECT APPROVAL (HPA)	WDFW	Use, divert, obstruct, or change natural flow Screens: 0.4 fps, 1.75mm bar, 2.4mm perf plate, 2.2mm wire mesh
SHORELINES SUBSTANTIAL DEVELOPMENT	Local Govt	In 100-yr. floodplain or within 200 ft. of high water > $2,500
COMPLIANCE WITH CRITICAL AREAS STANDARDS	Local Govt	Critical areas are designated by local governments
FLOODPLAIN MANAGEMENT	Local Govt	
401 WATER QUALITY CERT.	WDOE	Applicant for Fed license or permit for filling or exc. in water or wetlands
EXCEEDANCE OF WATER QUALITY STANDARDS	WDOE	Temporary exceedance (may not be included in new JARPA)
SECTION 404 PERMIT	US ACE	Locating structures, filling, or excavating in water or wetlands
OTHER STATE PERMITS		
ARCHAEOLOGICAL EXCAVATION	Ofc of Arch. & Historic Pres.	Fed projects require section 106 review
NPDES - GENERAL PERMIT FOR UPLAND HATCHERIES	WDOE	May not be needed for <20,000lbs. fish/yr. or <5,000lbs of feed/mo.
PRELIMINARY WATER RIGHT PERMIT	WDOE	Required for drilling and testing
CERT. OF WATER RIGHT	WDOE	Water use permit is the original application
CHANGE OF WATER RIGHT	WDOE	Location or use changes require permit
FISH/EGG TRANSPORT	WDFW	Main tool for WDFW to control movement of fish
OTHER LOCAL PERMITS		
CONSTRUCTION	Local govt	Building permits (including grading), vary by county
CONDITIONAL USE	Local govt	Activities use subject to public hearings
ZONING CODE VARIANCE	Local govt	
ESA RELATED PERMITS		
BIOLOGICAL EVALUATION (BE or BA)	USFWS, NMFS	Consultation used to show minimal impacts; if services agree, a concurrence letter is written
BIOLOGICAL OPINION (BO)	USFWS, NMFS	Issued after formal consultation
HATCHERY & GENETICS MGMT PLAN (HGMP)	NMFS	Replaces the BE for NMFS purposes
OTHER		
WETLAND AND FLOODPLAIN ASSESSMENT	BPA	Normally part of the NEPA document; requirement for federally funded projects
ENVIRONMENTAL LAND AUDIT	BPA	